

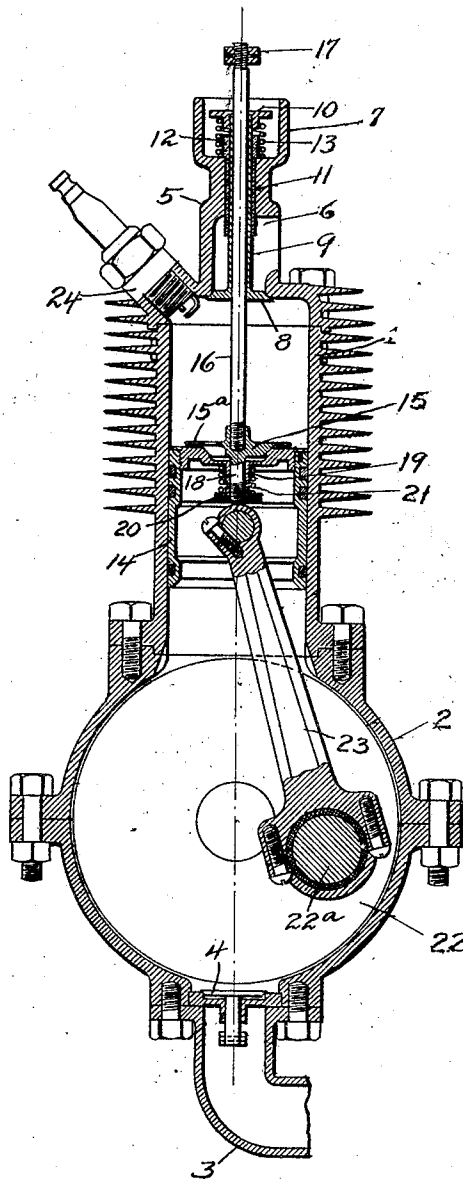
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TWO-CYCLE ENGINE

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Witness—

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JOHN K. GOLD, OF SHANGHAI, CHINA.

TWO-CYCLE ENGINE.

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To all whom it may concern:

Be it known that I, JOHN K. GOLD, a citizen of the United States, residing at Shanghai, China, have invented new and useful
5 Improvements in Two-Cycle Engines, of which the following is a specification.

This invention relates to improvements in internal combustion engines and more particularly to those of the "two-cycle" type,—
10 objects of the invention being to so construct a two-cycle internal combustion engine which shall be of compact construction, which will operate effectually and with maximum power and in which uniform power
15 shall be obtained.

A further object is to so construct a two-cycle internal combustion engine that a mixture may be employed which may be as clear as or clearer than that which would be used
20 with a four-cycle engine; which shall give maximum flexibility and fuel economy.

With these and other objects in view, the invention consists in certain novel features of construction and combinations of parts as hereinafter set forth and pointed out in the
25 claims:

The accompanying drawing is a sectional view of an internal combustion engine showing an embodiment of my invention.

30 While my improved engine may embody a plurality of cylinders, it will suffice to show and describe a single engine unit.

A cylinder of an internal combustion engine is shown at 1 and its lower flanged end is bolted to a crank casing 2,—the construction being such that the cylinder shall have free communication with said casing. An intake 3 is connected with the bottom of the crank casing and communication between
40 said intake and the casing 2 is controlled by a valve 4 located at the bottom of said casing. The upper head of the cylinder 1 is provided with an upwardly projecting extension 5 having an exhaust port 6 and the
45 upper end of said extension is formed to provide a cup 7 which may receive lubricant. The exhaust port 6 (which discharges laterally) is adapted to communicate with the upper end of the cylinder and said port is
50 controlled by an exhaust valve 8, the tubular stem 9 of which passes upwardly through the tubular cylinder head extension 5 and is provided within the cup 7, with a head 10. A bushing 11 surrounds the stem 9 within
55 the extension 5 and its upper end portion 12 is located within the cup 7. A coiled spring

13 encircles the head 10 and bushing portion 12 and tends normally to hold the former spaced from the latter.

A piston 14 is adapted to reciprocate within the cylinder 1 and provided with an intake port controlled by a valve 15. This valve is carried by a valve rod 16 which passes upwardly through the tubular stem 9 of the exhaust valve and terminates above
60 the cup 7 of extension 5, and is threaded to receive a nut or enlargement 17. The valve 15 is provided with a depending shank 18 which passes through a sleeve 19 depending from the head of the piston and the lower
70 end portion of said shank is threaded to receive a nut or abutment 20 for a spring 21,—the upper end of said spring bearing against the head of the piston 14. The intake valve 15 is provided with an annular flange 15^a
75 which serves to spread the incoming gaseous charge and insure proper distribution of the same within the cylinder.

The piston 14 is connected with the crankshaft 22 within the casing 2, by means of a
80 pitman 23. The gaseous charge will be compressed within the crank casing 2 by the downward motion of the piston, but in the present instance, the crank shaft comprises thick disks 22 suitably connected and provided with a wrist pin 22^a for connection
85 of the pitman 23 and hence most of the space within the crank case is filled by the crank shaft. Thus by reducing the space in the crank case, better crank-case compression
90 and complete scavenging and recharging of the cylinder is insured.

A spark plug 24 may be located at or near the upper end of the cylinder.

It will be observed that the cylinder intake valve 15 is directly in the center of the piston head; that the exhaust valve 8 is directly in the center of the cylinder head and that both valves are controlled by the valve
100 rod 16.

As the piston travels downward and nears the bottom of its stroke, the nut or enlargement 17 on the upper end of the valve control rod 16 strikes the head 10 on the upper end of the exhaust valve stem 9 forcing the
105 exhaust valve 8 down and causing it to open. (The exhaust valve is slightly smaller in diameter and has a weaker spring than the intake valve, which insures its opening before the intake valve.) As the piston continues
110 downward, the exhaust valve 8 is forced open until the head 10 strikes the top 12 of

the exhaust valve bushing 11 when the exhaust valve 8, the nut 17 and the valve control rod 16 are held stationary. The intake valve 15 is also held stationary at the lower
 5 end of the valve control rod 16 and as the piston continues downward, completing its stroke, it draws away from the intake valve 15 thus effecting the opening of the valve. When the exhaust valve 8 opens, the pressure from the burning gases of the previous explosion will be relieved and when the intake valve 15 opens, the fresh charge of gas which has been compressed in the crank case by the downward motion of the piston,
 15 rushes up through the intake valve 15, and is directed out against the wall of the cylinder by means of the horizontal flange 15^a on the top of said intake valve. As the gas strikes the walls of the cylinder, part of it is reflected back toward the center of the cylinder, making a uniform distribution of the fresh charge which rises uniformly in the cylinder, driving out completely and not mixing with the burned gases of the previous charge.
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As the piston completes its downward stroke and starts its upward stroke, it first comes against the intake valve 15, closing that valve and as it continues upward, the
 30 valve control rod or stem 16 is pushed up and the push nut 17 on the upper end of the valve control rod 16 releases the exhaust valve head 10, allowing the exhaust valve 8 to be closed by its spring. The piston then travels on upward, compressing the fresh charge and the explosion takes place at or near the top of its stroke. The upward stroke is completed and the piston is again on its downward stroke completing its cycle.
 40 The exhaust valve stem 9 and the valve control rod 16 are lubricated from the oil cup 7 at the top of the cylinder head extension 5. Small oil holes may be drilled through the exhaust valve stem 9 and through the upper part of the exhaust valve bushing 11, by which the oil gets to the exhaust valve stem 9 and the valve control rod 16. A small sheet metal cap about 4 inches high may be fitted over the top of the oil cup to protect
 45 the upper end of the valve control rod 16 and the interior of the oil cup from dirt.

Any suitable back pressure or check valve may be used for the crank case intake valve 4 and said valve may be made of aluminum
 55 in order to give the least possible resistance to the gas as it is drawn into the crank case.

Having fully described my invention what I claim as new and desire to secure by Letters-Patent, is:—

60 1. In an internal combustion engine, the combination with a cylinder and piston, of an intake valve and an exhaust valve, the former carried by the piston and the latter carried by the cylinder, and a valve rod extending through and beyond the end of the
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cylinder and cooperable with both of said valves.

2. In an internal combustion engine, the combination with a cylinder provided with an exhaust port, and a piston, of an intake
 70 valve carried by and cooperable with said piston, an exhaust valve for the exhaust port, and a valve rod secured to the intake valve and extending through and beyond the end of the cylinder and arranged to
 75 open the exhaust valve.

3. In an internal combustion engine, the combination with a cylinder provided with an exhaust port, and a valved piston, of an
 80 exhaust valve having a tubular stem, a rod secured to the valve of the piston and passing completely through the stem of the exhaust valve, a part on said rod to engage the stem of the exhaust valve, and spring means for closing the respective valves.
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4. In an internal combustion engine, the combination of a cylinder, a piston, a spring-seated intake valve carried by said piston, an exhaust valve in the end of the
 90 cylinder having a tubular stem provided with a head at its upper end external to the cylinder, a spring under said head tending to close the exhaust valve, a rod secured to said intake valve and passing completely
 95 through and beyond the tubular stem of the exhaust valve, and a member on said rod to engage the head on the stem of the exhaust valve when the piston descends whereby to open the exhaust valve.

5. In an internal combustion engine, the
 100 combination of a cylinder, a piston, a spring-seated intake valve carried by said piston, an exhaust valve having a tubular stem extending beyond the end of the cylinder and provided with a head at its upper end, a
 105 spring under said head tending to close the exhaust valve, means below said head for limiting the opening movement of the exhaust valve, a rod secured to said intake
 110 valve and passing through and beyond the tubular stem of the exhaust valve, and a member on said rod to engage the head on the stem of the exhaust valve when the piston descends whereby to open the exhaust
 115 valve.

6. In an internal combustion engine, the combination of a cylinder provided with an upward extension having an exhaust port to communicate with the upper end of the
 120 cylinder, a piston, an intake valve carried by said piston, an exhaust valve having a tubular stem passing through the cylinder extension, a head on said stem, a spring engaging said head to close the exhaust valve, and a rod secured to the intake valve, pass-
 125 ing completely through the tubular stem of the exhaust valve and provided with a part to engage the head of the stem of the exhaust valve and open the latter.

7. In an internal combustion engine, the
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combination of a cylinder, an upward extension on the head of said cylinder, a bushing in said extension, an exhaust valve having a tubular stem passing through said bushing, a head on said stem, a spring engaging said head and raising the same above the upper end of the bushing, a valved piston in the cylinder, a rod secured to the valve of the piston and passing through the stem of the exhaust valve, and a part on said rod to engage the head of the stem of the exhaust valve and depress the latter to open it.

8. In an internal combustion engine, the combination of a cylinder, an upward extension on the head of the cylinder and having an exhaust port and having a cup at its upper end, a bushing in said extension extending into said cup, an exhaust valve having a tubular stem passing through said bushing and terminating within said cup, a head on said stem, a spring engaging said head to

close the exhaust valve, a valved piston in the cylinder, and a rod secured to the valve of the valved piston, passing through the tubular stem of the exhaust valve and provided with a part to engage the head on said stem.

9. In an internal combustion engine, the combination of a cylinder, an exhaust valve in the end of the cylinder, a spring external to the cylinder tending to close said valve, a piston, an intake valve carried by the piston and having a peripheral flange overhanging the piston a central stem depending from the intake valve, an abutment on said stem, a spring between said abutment and the piston, a rod secured to said intake valve and extending therefrom through the exhaust valve and beyond the cylinder, and means whereby said rod will operate to open the exhaust valve.

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